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DISCRETE-EVENT-SIMULATION AN APPROACH THAT CHALLENGES TRADITIONAL MODELING METHODS? AN ILLUSTRATION USING DRUG-ELUTING STENTS

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OBJECTIVES: Despite the flexibility of Discrete-Event-Simulation it is rarely used in decision analytic modelling in health care. To illustrate the benefits of applying this modelling approach, treatment allocation strategies for patients with cardiovascular disease are evaluated. This methodological study demonstrates how capacity constraints effect cost-effectiveness and additional parameters for decision-making. **METHODS:** Cost-effectiveness analysis is usually done for separate patient subgroups assuming unrestricted availability of capacities, or the capacity constrainsts are incorporated addressing only fixed waiting times. However, in "real-world" application, a successful new treatment given to only one subgroup of patients can influence the whole patient cohort over time. For example, when medical advances reduce the need for repeated interventions and procedures, it increases available capacity. Newly developed drug-eluting stents (DES) show promising reductions in repeated revascularizations in specific cohorts (i.e. diabetics). Treatment allocation strategies or guidelines determine which patients will receive DES versus the alternative bare-metal stents (BMS). A Discrete-Event-Simulation is used to estimate the outcome of treatment allocation strategies for cardiovascular disease including the long-term costs and effects of the procedures, utilization factors and budgetary information. The simulation assumes several capacity restrictions and takes into account daily patient arrivals and how they effect the system as a whole. **RESULTS:** In the stent simulation, a hypothetical capacity limitation for cardiovascular intervention changes the ranking of efficient treatment strategies in such a way that certain strategies become dominated. Therefore, these treatment options should not be taken into consideration. Furthermore, evaluating treatment strategies has the advantage of generating not only cost-effectiveness outcomes but also utilization and budgetary impact within the same simulation. **CONCLUSIONS:** Discrete-Event-Simulation provides a wide range of multiple perspective outcomes. In comparison to Markov and Decision-tree models, capacities can be explicitly incorporated. This can change the relative cost- effectiveness results and has significant impact on decision-making.

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TOWARDS A MODELLED ECONOMIC EVALUATION TO IDENTIFY THE OPTIMAL POPULATION FOR SCREENING OF CORONARY ARTERY DISEASE

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OBJECTIVES: Currently, only symptomatic patients are screened for CAD, leaving those asymptomatic but at risk patients unscreened and therefore unaware of their disease burden. Improved asymptomatic screening is an area of unmet medical need, given that 50% of CAD patients present with a myocardial infarction as their first symptom. Our objective was to develop an epidemiological and economic model to describe the cost-effectiveness of screening for coronary artery disease in at-risk populations. **METHODS:** A Markov microsimulation model was developed to compare CAD screening strategies for asymptomatic patients. The screening algorithm is defined based on its ability to risk stratify the population as measured by the area under the receiver operating characteristic curve. The structure of the economic model links three main hypotheses: 1) screening for CAD provides improved risk stratification; 2); which leads to initiation of effective and cost-effective interventions; and 3) effective interventions reduce the burden of CAD. Outcomes are measured as incidence of major adverse cardiovascular events (MACE). The population in the model is defined according to age, sex, diabetes status and ethnicity. The economic model can be calculated for a population with any combination of these risk factors. **RESULTS:** On the basis of United States CAD registry data, the model identified segments of the population with the highest incidence of CAD and therefore with the greatest capacity to benefit from CAD screening. These segments are defined according to observable risk factors meaning they can be used to identify a population eligible for CAD screening. **CONCLUSIONS:** Screening for CAD has the potential to reduce disease burden and save lives. The model may be a useful tool to 1) improve risk stratification techniques for asymptomatic screening; 2) identify populations where screening may be cost-effective; and 3) identify areas where clinical data is needed to support model validation.

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CLASSIFYING PATIENTS WITH DYSLIPIDEMIA: A LATENT CLASS ANALYSIS

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OBJECTIVE: To identify and characterize subclasses of patients with dyslipidemia in a nationally representative sample using Latent Class Analysis (LCA). **METHODS:** Dyslipidemia patients were identified from a national database of electronic medical records containing diagnosis, lab and medication information in primary care setting from 1997 to 2004. LCA was applied to patient classification based on patient demographics, biomarker measures (low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), total cholesterol (TC), and triglyceride (TG)), and pre-existing coronary heart disease (CHD), diabetes and hypertension. **RESULTS:** There were 72,533 patients included in this analysis. All information indices and Lo-Mendell-Rubin test consistently suggested that a 5-class model fit the data best. Patients were classified into one of the five classes with sizes of 17.7%, 9.6%, 29.4%, 32.6% and 10.8%, respectively. Patients in Class 1 were featured with 34.4% of HDL-C and 39.5% of TG abnormalities and high prevalence of CHD (29.6%), diabetes (31.5%), and hypertension (78.2%). Patients in Class 2 shared similar lipid-profile as those in Class 1, but smaller percent of them carried co-morbidities. Classes 3 and 4 were dominated by those with high LDL-C and TC, but higher percent of patients in Class-3 had co-morbidities. Class 5 was characterized by patients with abnormalities for all four biomarkers (80.0% for LDL-C, 76.8% for HDL-C; 99.4% for TC, and 81.4% for TG). Patients in Classes 1 and 3 were more likely on antidyslipidemics at diagnosis, suggesting that co-morbid CHD, diabetes and hypertension are strong predictors of pharmacotherapy in primary care setting. **CONCLUSIONS:** LCA appears to offer a useful approach to studying case-mix of patients with dyslipidemia by classifying patients into clinically similar sub-groups, which might provide better insights to understand unmet needs and identify appropriate treatment options. Our findings suggest that co-